48+6 / 60

Calculus 1 First

54 / 60

Palestine Technical University
Mathematics Department.
~~Linear Algebra I (Math 127).~~
Dr. Khalida Nazzal
First Exam

90 / 100

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Student name بالعربيه:
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Nov, 4, 2009

RTN 11:00 - 11:50

I :(36 points) Choose the correct answer.

1. The solution of the inequality $\left|\frac{2}{x}-4\right|<1$ is

a) $(\frac{2}{5},\frac{2}{3})$ b) $(\frac{3}{2},\frac{7}{2})$

c) $\infty-(\frac{2}{5},\frac{2}{3})$ d) $\infty-(\frac{3}{2},\frac{7}{2})$.

$-1<\frac{2}{x}-4<1$
$+4 \quad +4 \quad +4$
$3<\frac{2}{x}<5$
$\frac{1}{3}>\frac{x}{2}>\frac{1}{5}$

$\frac{2}{5}<x<\frac{2}{3}$

$\frac{2}{3}>x>\frac{2}{5}$

2. If $\lim_{x\to 0^+}(4g(x))^{\frac{1}{3}}=2$, then $\lim_{x\to 0^+} g(x)=$

a) 8 b) 4

c) 2 d) -2.

$\sqrt[3]{4x}=2$
$4x=8 \quad x=\frac{8}{4}=2$

3. $\lim_{x\to\infty}\frac{\cos x-1}{x}=$

a) ∞.
b) 1
c) D.N.E.
d) 0.

$\frac{\infty}{\infty}$

$\lim_{x\to\infty}\frac{\cos x-1}{x}\left(\frac{\cos x+1}{\cos x+1}\right)=\frac{\cos^2 x-1}{x(\cos x+1)}=\frac{-\sin^2 x}{x(\cos x+1)}$

$\sin^2 x+\cos^2 x=1$

$=\lim_{x\to\infty}\frac{-\sin x}{x}\cdot\frac{\sin x}{\cos x+1}=1.0=0$

4. Let $f(x)=\frac{1}{x-1}$, and $g(x)=\sqrt{x}+1$, then the domain of the function $(fog)(x)$ is

a) $[0,\infty)$.
b) $(0,1)\cup(1,\infty)$
c) $(0,\infty)$.
d) $(-\infty,0)\cup(0,\infty)$.

$\frac{1}{x-1} \Rightarrow x-1=0 / x=1 \quad x\geq 1$

$f(g(x))=\frac{1}{(\sqrt{x}+1)-1}=\frac{1}{\sqrt{x}}=\frac{1}{\sqrt{x}} \quad x\neq 0$

5. The vertex of the parabola $-2x^2+4x+1$ is

a) (0, 1).
b) (3, -5).
c) (2, 1).
d) (1, 3).

$\frac{-b}{2a}=\frac{-4}{2(-2)}=\frac{-4}{-4}=1$

$f(1)=-2(1)^2+4(1)+1$
$-2+4+1$
$=2+1=3$

30
4
14
48

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6. The function $f(x) = x^3 - 2x + 2$ has

a) a zero between -2 and 0.
b) a zero between 2 and 3.
b) no roots.
d) no y intercepts.

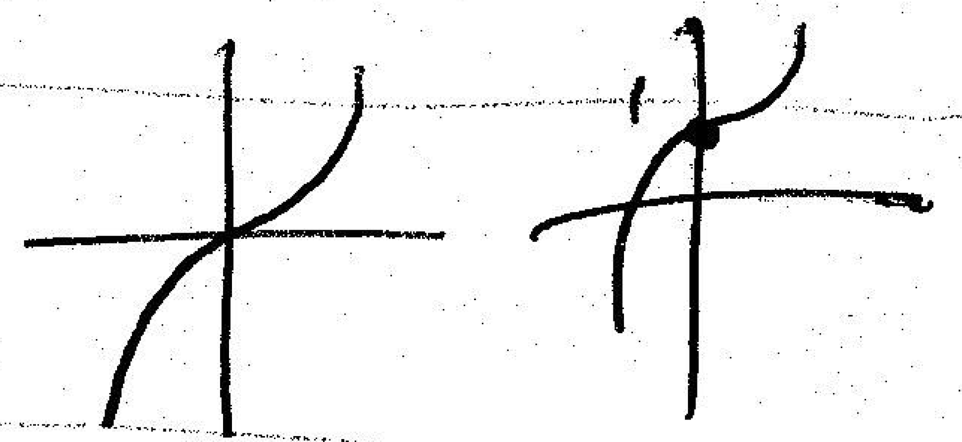
$(-2)^3 - 2(-2) + 2$
$-8 + 4 + 2$
-2 $\quad$ 2

$[-2, 0]$ → have zero between $[-2, 0]$

7. If f is odd and $\lim_{x\to 0^-} f(x) = 1$, then $\lim_{x\to 0^+} f(x) =$

a) 1. $\qquad$ b) -1.
c) 0. $\qquad$ d) else.

$f(-x) = -f(x)$



8. The graph of the equation $x^2 + y^2 - 4x - 6y - 3 = 0$ is

a) a circle centered at (2, 3) and radius 4.
b) a circle centered at (-2, 3) and radius 3.
c) a circle centered at (-2, 3) and radius 4.
d) an ellipse centered at (2, 3).
e) an ellipse centered at (-2, 3).

$(x^2 - 4x + 4) + (y^2 - 6y + 9) = 4 + 9 + 3$
$(x - 2)^2 + (y - 3)^2 = 16$
$(2, 3)$ radius 4

9. Let $f(x) = \begin{cases} \sqrt{-x} & -4 \le x \le 0 \\ \sqrt{x} & 0 < x < 4 \end{cases}$. Then, the range of f is

a) $[-4,4]$
b) $[-2,2)$
c) $[0,2)$
d) $[0,2]$.

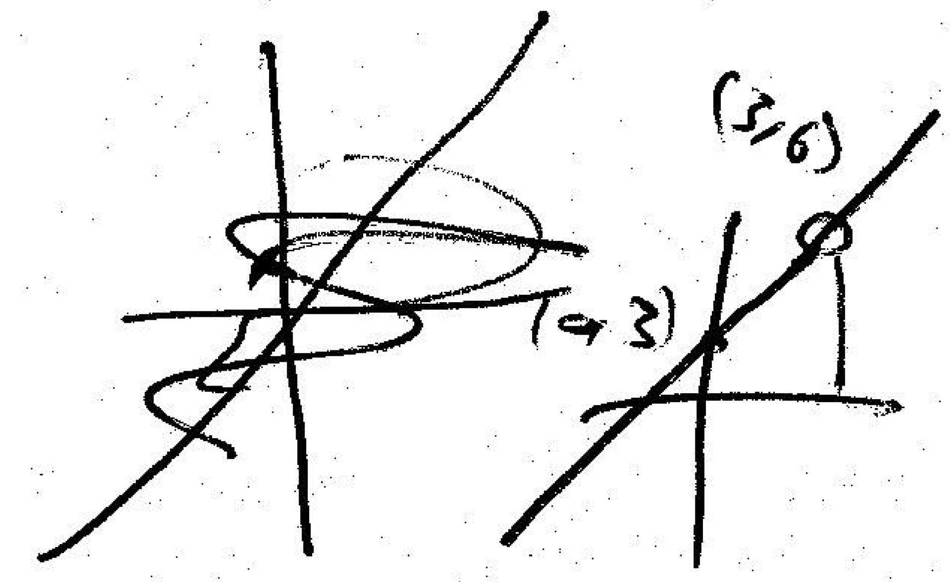
$0, 2$
$[0, 2)$

10. At $x = 3$, the function $f(x) = \dfrac{x^2 - 9}{x - 3}$ has

a) infinite discontinuity.
b) a removable discontinuity.
c) a jump discontinuity.
d) a horizontal asymptote.

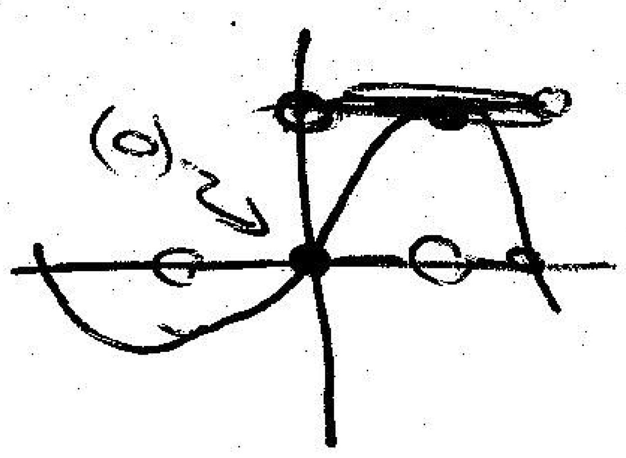
$\dfrac{(x-3)(x+3)}{x-3}$ $\quad$ $(x+3)$ $\quad$ $x \ne 3$ $\quad$ $y = 3$

$f(3) = 3 + 3 = 6$



11. $\lim_{x\to 0^+} = \sin\lfloor x \rfloor =$

a) 0
b) 1
c) -1
d) DNE.



12. The equation of the line that passes through (1, -1) and normal to the line $y = 3x + 9$ is

a) $y = x + 2$.
b) $y = -x - 4$.
c) $3y + x + 2 = 0$.
d) $y = 4 - x$.

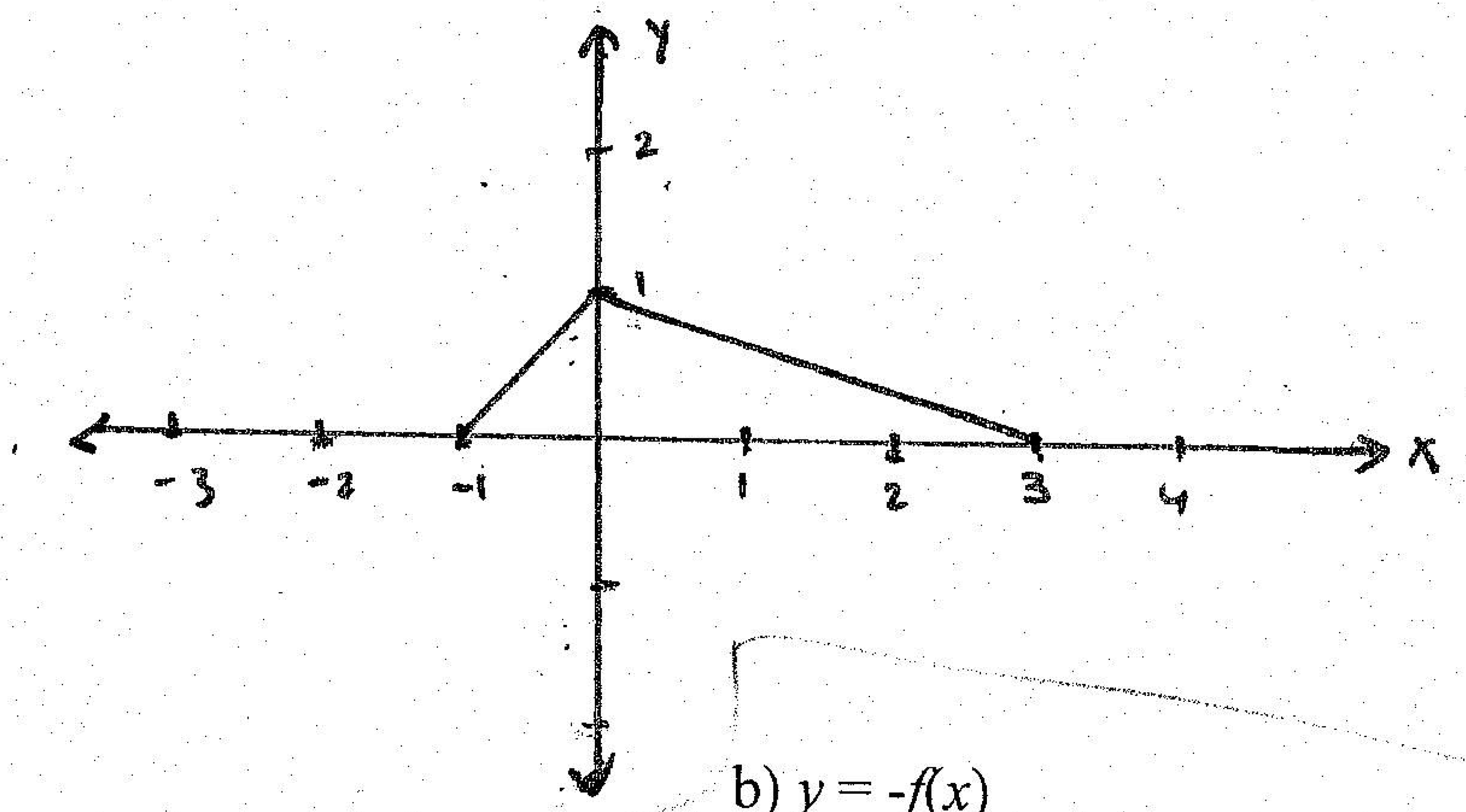
$y = 3x + 9$
$m_1 = 3$
$m_1 m_2 = -1$
$3 m_2 = -1 \Rightarrow m_2 = \frac{-1}{3}$

$y - y_0 = m(x - x_0)$
$y - -1 = \frac{-1}{3}(x - 1)$
$y + 1 = \frac{-1}{3}x + \frac{1}{3} \Rightarrow y = \frac{-1}{3}x - \frac{2}{3}$ $\quad \times 3$

$3y + x + 2 = 0$
$3y = -x - 2$

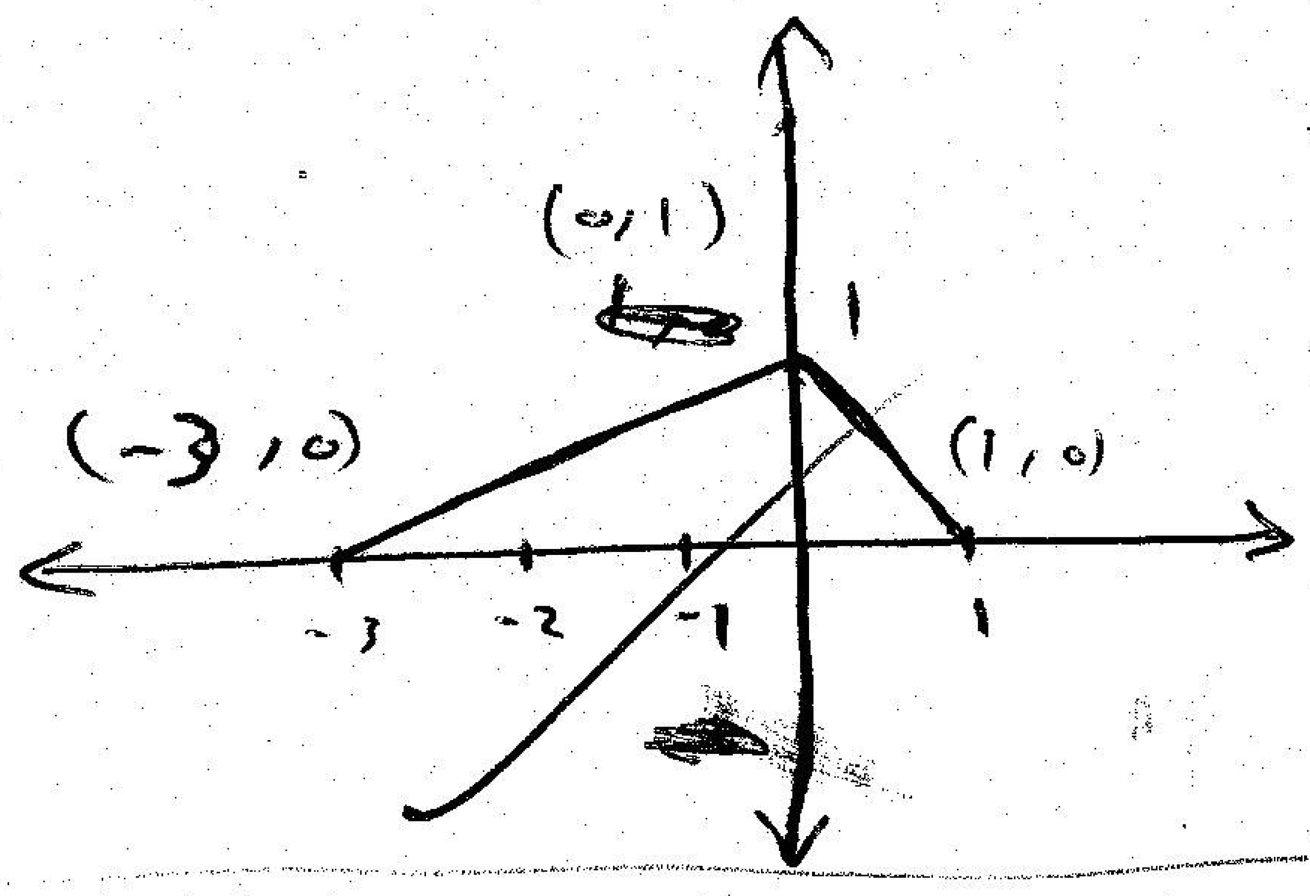
II

1. The graph of f is shown. Draw the graph of each function (10 points)



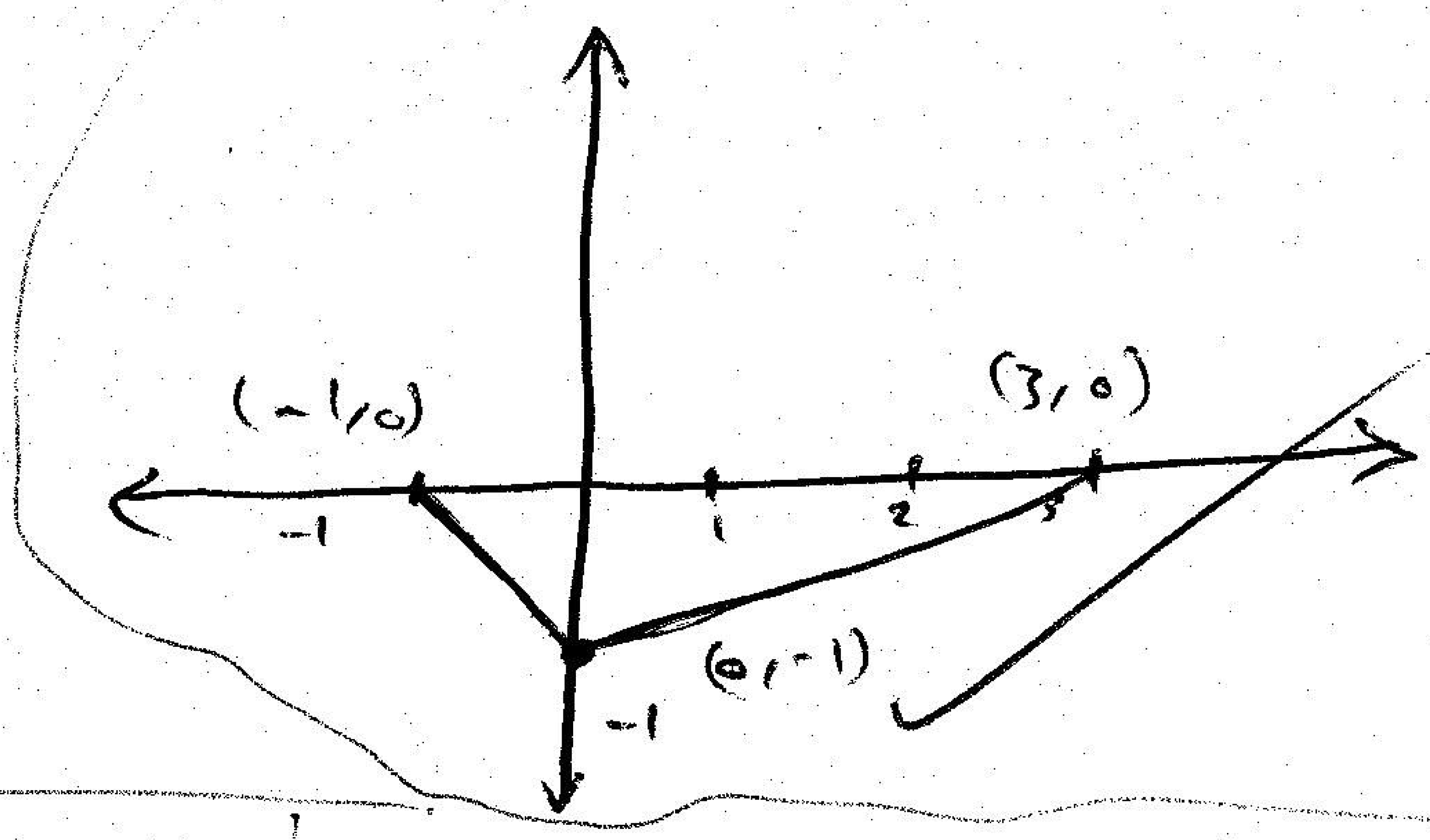
a) $y = f(-x)$.

reflection about Y-axis



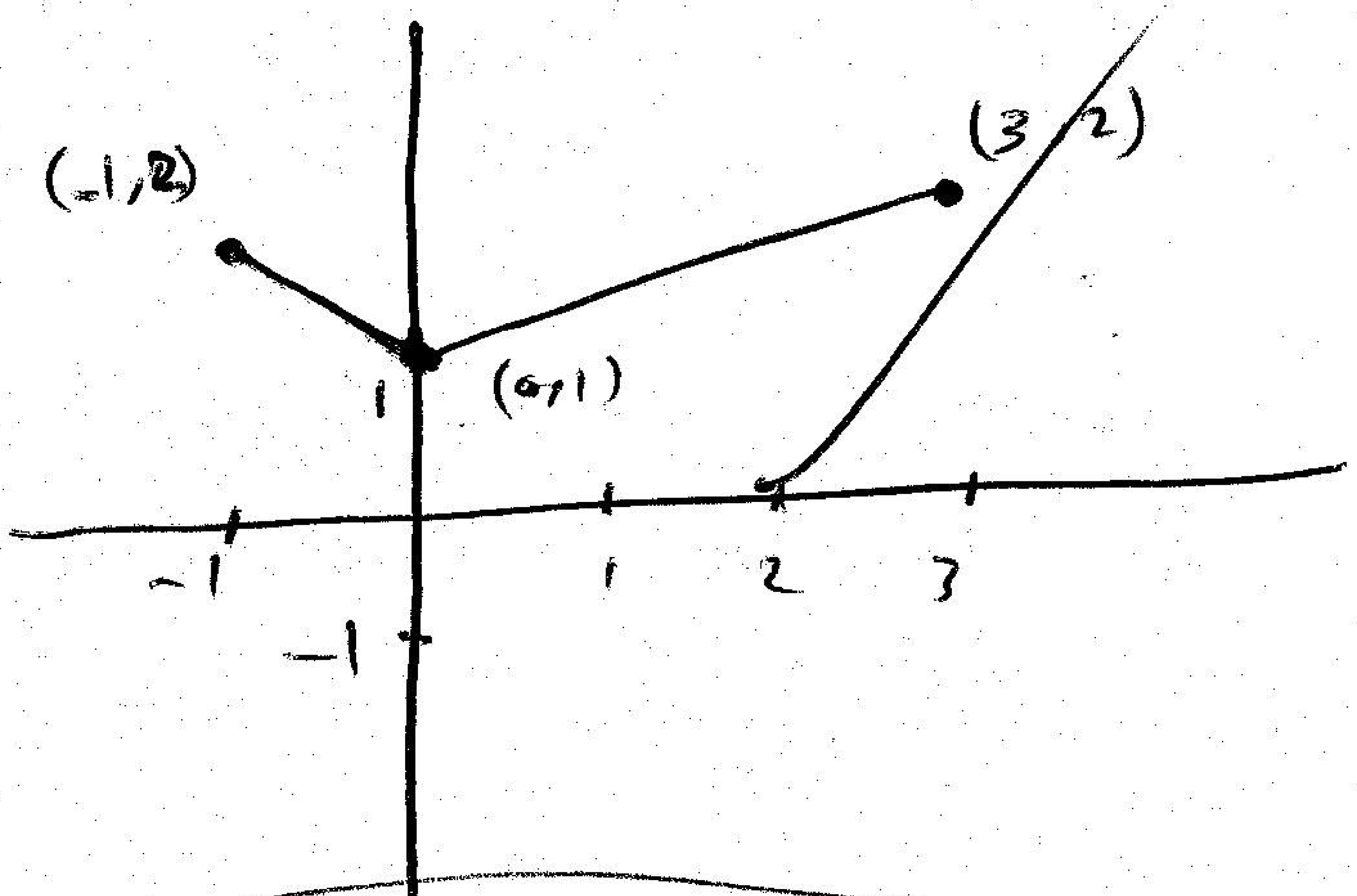
b) $y = -f(x)$

reflection about X-axis



c) $y = 2 - f(x)$

$Y = -f(x) + 2$



reflection about X-axis

and shifts 2 units above

d) $y = f(x-2)+1$

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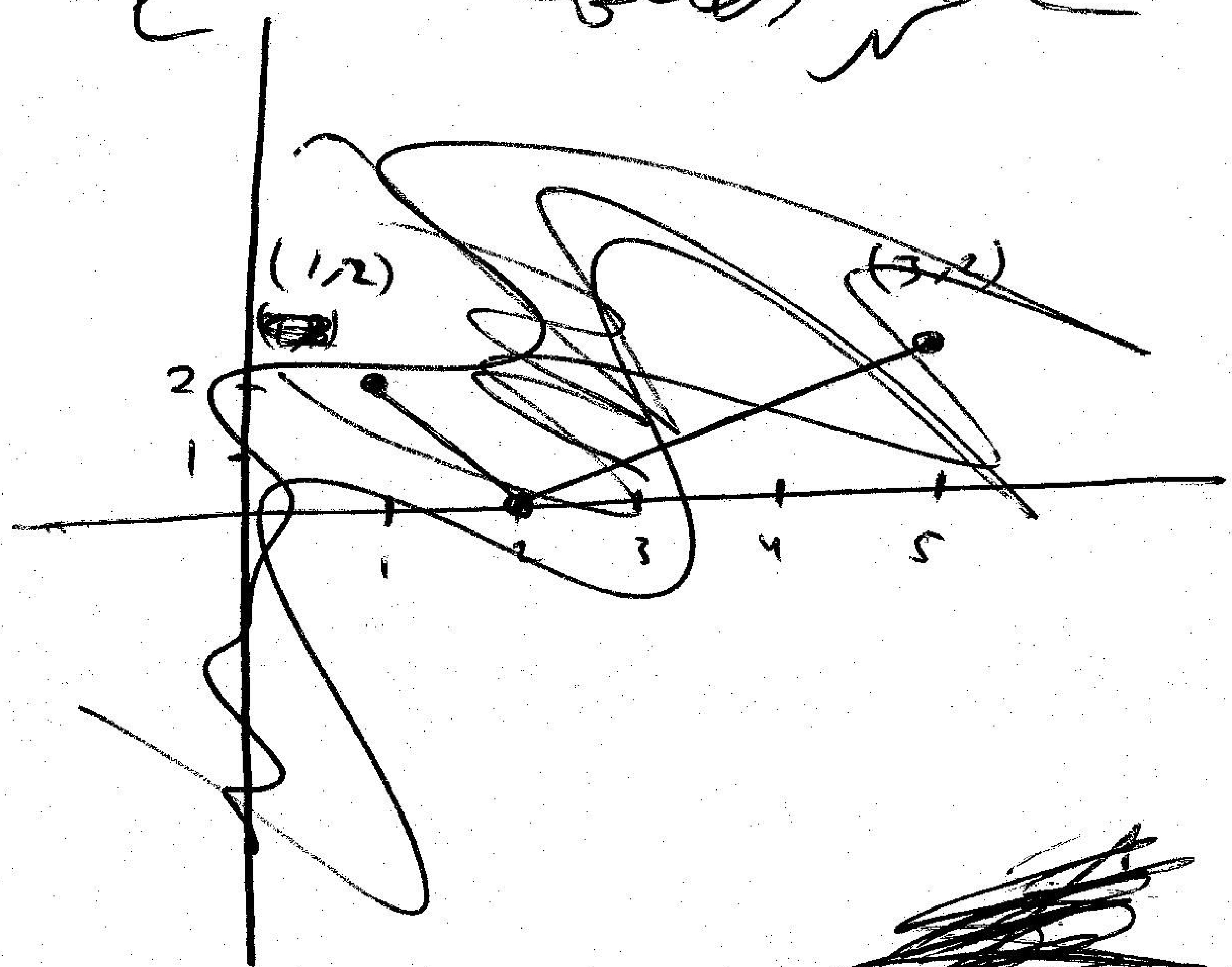

~~Shifts 2 units right~~

~~Shifts 1 unit above~~

0

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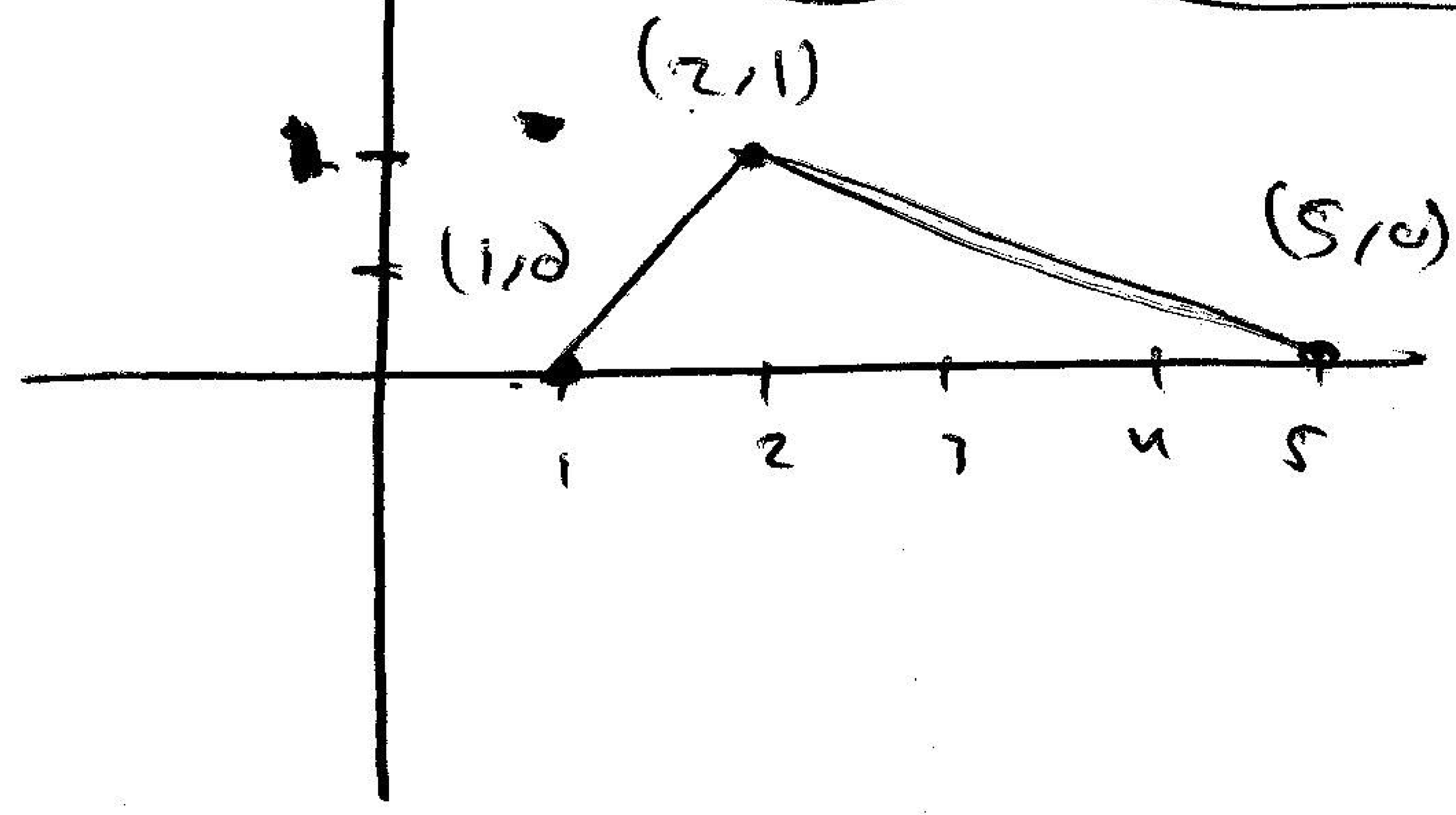
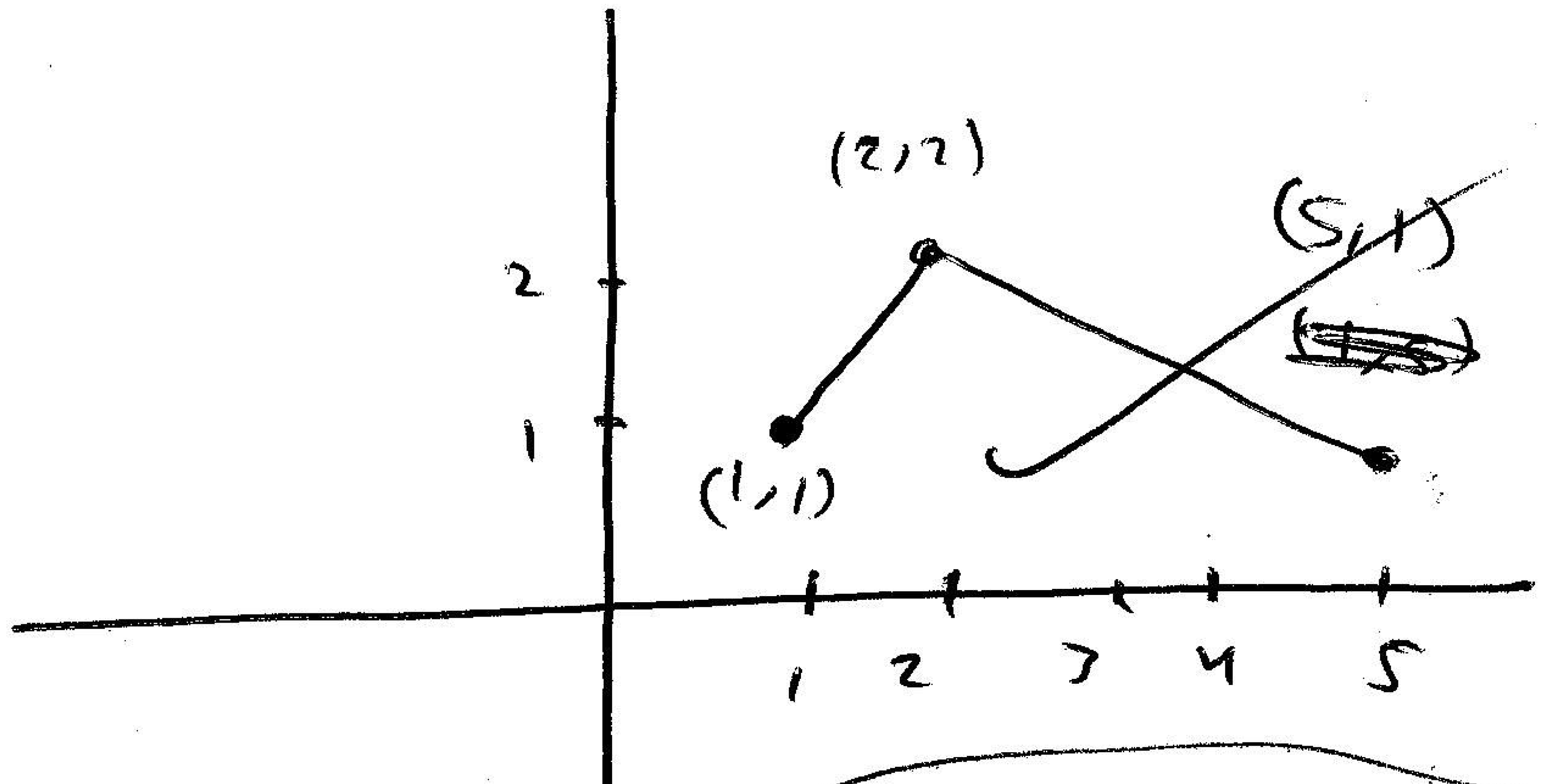
d

shifts 2 units to the right





then: shifts 1 unit ~~to~~ above

2. Consider the function $f(x)=\dfrac{2x+3}{x+1}$. (14 points)

a) Find the functions' x and y intercepts.

$\boxed{x\text{-intercept}} \Rightarrow y=0$ $\qquad \dfrac{2x+3}{x+1}=0$

$\Rightarrow 2x+3=0 \Rightarrow \boxed{x=\frac{-3}{2}}$ $\longrightarrow \left(\frac{-3}{2}, 0\right)$

$\boxed{y\text{-intercept}} \Rightarrow x=0$ $\qquad \dfrac{2(0)+3}{0+1}=\dfrac{3}{1}$

$=\boxed{3}$ $\longrightarrow (0,3)$

b) $\lim\limits_{x\to\infty} f(x) = \dfrac{2x+3}{x+1} = \dfrac{\frac{2x}{x}+\frac{3}{x}}{\frac{x}{x}+\frac{1}{x}} = \dfrac{2+0}{1+0} = \boxed{2}$

c) $\lim\limits_{x\to-\infty} f(x) = \dfrac{2x+3}{x+1} = \dfrac{\frac{2x}{x}+\frac{3}{x}}{\frac{x}{x}+\frac{1}{x}} = \dfrac{2+0}{1+0} = \boxed{2}$

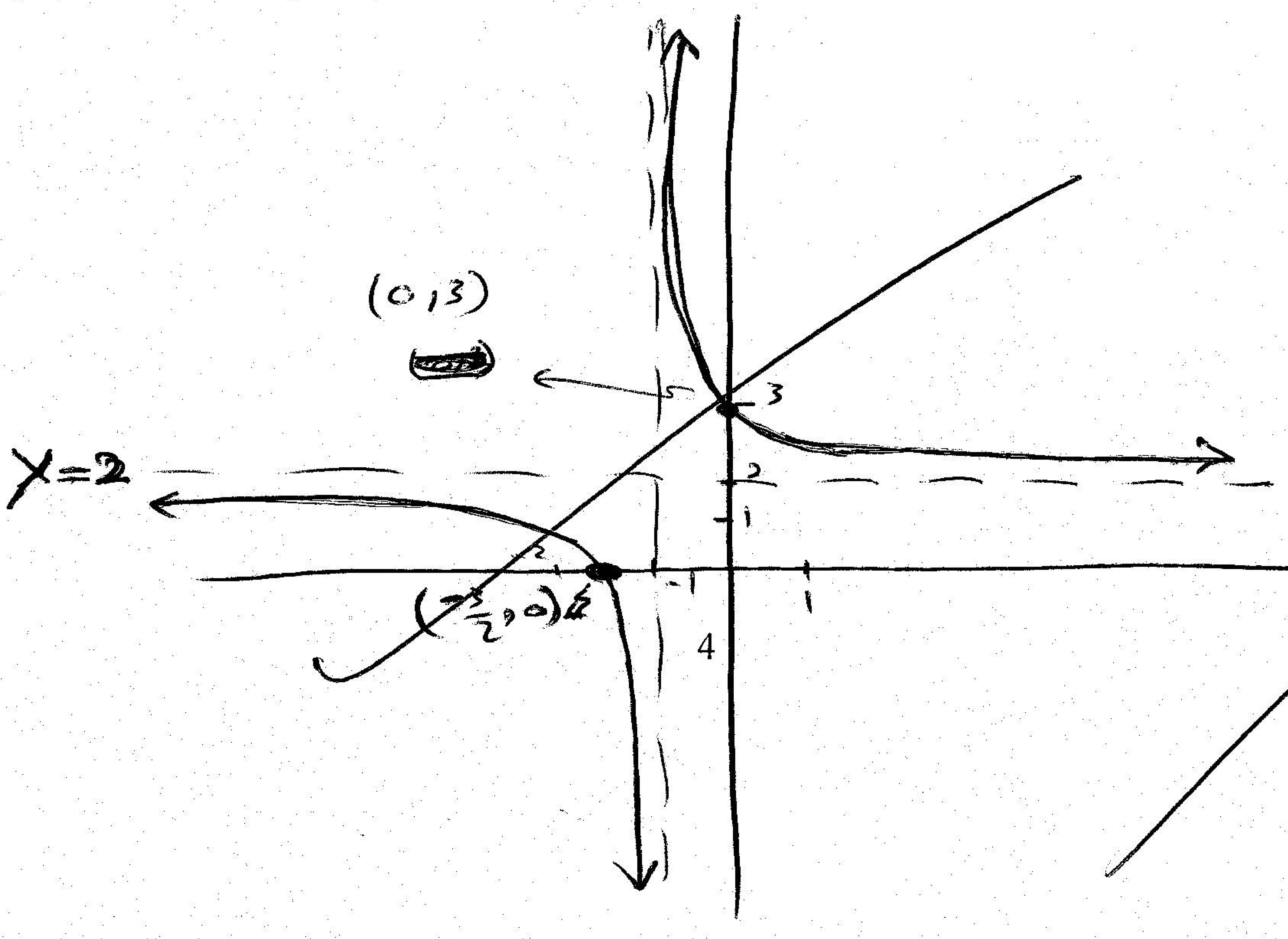
d) $\lim\limits_{x\to-1^+} f(x) = \dfrac{2x+3}{x+1} = \boxed{+\infty}$

e) $\lim\limits_{x\to-1^-} f(x) = \dfrac{2x+3}{x+1} = \boxed{-\infty}$

f) The equation of the horizontal asymptote (if exists) is $\boxed{y=2}$

g) The equation of the vertical asymptote (if exists) is $\boxed{x=-1}$

h) Sketch the graph of f. $x=-1$



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